

# Audio-Electronic Products Design

## Description:

In this course we will explore what is required to bring an electronics product from concept to the consumer's hand. Although we will be using the audio market as a case study this semester, the majority of the material covered will be relevant to most electronic products. Students will be required to design and build prototypes of their ideas, along with producing sales, distribution, and marketing plans.

## Prerequisites:

None. Although, as the class is very hands-on, enrollment will be limited to 12 students, with priority given to MAS graduate students.

**Units:** 12 (4-4-4)

Schedule: MF 1-3, E15-341

## Grading:

The course is Pass/Fail. Students must complete all assignments and have a satisfactory attendance record. There will be a lab or problem set (50%) due each week, and a final project (50%).

**Syllabus:** Lecture topics, in sequence. Number in parentheses is number of lectures on that topic.

1. (1) Introduction - course objectives, structure. the design cycle. what is the value of an idea?
2. (1) Audio market place - what products are available, who buys them, how many get sold, what prices they go for, etc.
3. (2) Audio theory - how is sound created, converted between electrical and mechanical domains? how do we perceive sound, how do we talk about sound? various sound synthesis models. audio DSP.
4. (3) Mechanical product design - form studies, user interface design, user studies, mechanical prototyping, visual languages. sketching. ideation exercises.
5. (2) Basic electronics - voltage, current, power. capacitors, inductors, resistors, diodes.
6. (3) Microcontrollers - available platforms, how to program them, limitations of common IDEs. digital communication.
7. (2) Intermediate electronics - opamps, transistors, multipliers, filters, oscillators.
8. (1) PCB layout - space usage, trace size, interference, ringing. various PCB types and board houses.
9. (2) I/O - sensors, speakers, motors, LEDs, high power circuits.
10. (2) Sales and distribution - various scales of sales, marketing and promotion, funding models

(bootstrap, crowd-source, VC, etc), product naming and differentiation, brand building, pricing strategy.

11. (2) Manufacturing - various scales of manufacturing. kits, part sourcing, in-house versus outsourcing, PCB assembly, interfacing with foreign manufacturers, lead times, cost reduction, DFM.

12. (1) Final project presentations.